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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte EIJI MARUYAMA

Appeal 2010-010044
Application 10/790,759
Technology Center 1700

Before TERRY J. OWENS, JEFFREY T. SMITH, and
MICHAEL P. COLAIANNI, *Administrative Patent Judges*.

OWENS, *Administrative Patent Judge.*

DECISION ON APPEAL

STATEMENT OF THE CASE

The Appellant appeals under 35 U.S.C. § 134(a) from the Examiner's rejection of claims 8-11, 14, 19 and 20, which are all of the pending claims. We have jurisdiction under 35 U.S.C. § 6(b).

The Invention

The Appellant claims a photovoltaic device. Claim 8 is illustrative:

8. A photovoltaic device comprising:

a first conductivity type crystalline semiconductor substrate having a front surface and a back surface and receiving light incident from the side of said front surface;

a substantially intrinsic first amorphous semiconductor layer formed on said front surface of said crystalline semiconductor substrate, the substantially intrinsic first amorphous semiconductor layer consisting of a single layer;

a second conductivity type second amorphous semiconductor layer formed on said first amorphous semiconductor layer; and

a transparent conductive film, formed on said second amorphous semiconductor layer, including an indium oxide layer having (222) plane orientation with two (222) peaks in said indium oxide layer, wherein said two (222) peaks includes a first peak having an intensity (I1) and a second peak having an intensity (I2) and the ratio (I1/I2) of the intensity (I1) of said first peak to the intensity (I2) of said second peak is at least 0.48 and around 0.5,

wherein said indium oxide layer contains Sn, and the content of Sn with respect to In in said indium oxide layer is at least about 2 percent by weight and not more than about 7 percent by weight,

wherein a collector is formed on the transparent conductive film.

The References

D.G. Neerinck and T.J. Vink, "Depth profiling of thin ITO films by grazing incidence X-ray diffraction", 278 *Thin Solid Films* 12-17 (1996).

F.O. Adurodija et al., "Effect of Sn doping on the electronic transport mechanism of indium-tin-oxide films grown by pulsed laser deposition coupled with substrate irradiation", 88 *J. Appl. Phys*. 4175-80 (2000).

The Rejections

Claims 8-11, 14, 19 and 20 stand rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement, and

under 35 U.S.C. § 103 over the Appellant's admitted prior art in view of Neerinck and Adurodija.

OPINION

We reverse the rejection under 35 U.S.C. § 112, first paragraph, and affirm the rejection under 35 U.S.C. § 103.

Rejection under 35 U.S.C. § 112, first paragraph

For an applicant to comply with the 35 U.S.C. § 112, first paragraph, written description requirement, the applicant's specification must "convey with reasonable clarity to those skilled in the art that, as of the filing date sought, he or she was in possession of the invention." *Carnegie Mellon University v. Hoffmann-La Roche Inc.*, 541 F.3d 1115, 1122 (Fed. Cir. 2008), quoting *Vas-Cath Inc. v. Mahurkar*, 935 F.2d 1555, 1563-64 (Fed. Cir. 1991).

The Examiner argues that "[t]he phrase 'at least 0.48' is an exclusionary proviso which excludes any values less than 0.48, and there is no disclosure of 'the ratio (I_1/I_2) of the intensity (I_1) of said first peak to the intensity (I_2) of said second peak is at least 0.48 and around 0.5' being specifically contemplated in the specification as originally filed" (Ans. 3).

The Appellant argues that "[a]s illustrated in FIG. 6 of the application-as-filed, the cell output (Pmax), which is represented by a square mark "□," varies according to change of the peak intensity ratio (I1/I2), which is the ratio of the intensity (I1) of the first peak to the intensity (I2) of the second peak. The cell output (Pmax) has the maximum value when the peak intensity ratio (I1/I2) is at least 0.48 and around 0.5. (*See* page 26, lines 6-14 of the application-as-filed)" (Br. 5-6).

The Examiner responds that the Appellant's Specification is open to intensity ratios of 0.07 to 0.9 (p. 8, ll. 1-4) and does not mention that the ratio is at least 0.48 such that values less than that are excluded (Ans. 9).

The Appellant's Figure 6 shows a maximum cell output (Pmax) at an I1/I2 ratio of 0.48, and the Appellant's Specification states that "[i]t is also understood from Fig. 6 that the cell output (Pmax) is increased in proportion to the peak intensity ratio (I1/I2) when the peak intensity ratio (I1/I2) is in the range of up to 0.5, maximized when the peak intensity ratio (I1/I2) is around 0.5, and reduced when the peak intensity ratio (I1/I2) exceeds 0.5" (Spec. 26:6-11). Thus, the Appellant's original disclosure would have conveyed to one of ordinary skill in the art with reasonable clarity that the Appellant was in possession of an intensity ratio (I1/I2) value which is at least 0.48 and around 0.5. Accordingly, we do not sustain the rejection under 35 U.S.C. § 112, first paragraph.

Rejection under 35 U.S.C. § 103

The Appellant argues the claims as a group (Br. 6-8). We therefore limit our discussion to one claim, i.e., claim 8. The other claims stand or fall with that claim. *See* 37 C.F.R. § 41.37(c)(1)(vii) (2007).

Claim 8 requires that "said two (222) peaks includes a first peak having an intensity (I1) and a second peak having an intensity (I2) and the ratio (I1/I2) of the intensity (I1) of said first peak to the intensity (I2) of said second peak is at least 0.48 and around 0.5".

Neerinck discloses tin-doped In_2O_3 (ITO) films having a stressed top layer and a stress-free bottom layer which show a doublet-type X-ray diffraction spectrum of the (222) peak, i.e., a low-angle peak from the stressed top layer and a high-angle peak from the stress-free bottom layer,

when the incidence angle (ω) of the X-ray diffractometer beam is greater than the 0.32° critical angle for total external reflection (p. 13, first two paragraphs under "Experimental"). "For small ω [greater than ω_c] the diffracted intensity will mainly result from the top layer of the ITO film, yielding a relatively high low-angle peak. For ω significantly above ω_c, both the top and bottom layer will contribute" (p. 13, third paragraph under "Experimental"). As the incidence angle (ω) is increased above ω_c, the intensity of the high-angle peak from the stress-free bottom layer increases relative to the intensity of the low-angle peak from the stressed top layer (p. 13, third paragraph under "Experimental"; Fig. 2).[1]

The Appellant argues that "[w]hat is controlled by changing the value of the incidental angle ω is not the relative intensity ratio of the first peak intensity (I1) to the second peak intensity (I2), but the number of peaks" (Br. 7).

Neerinck states that "[c]hanging the angle of incidence ω in GIABXD 2θ scans leads to a change in relative intensity of the constituent peaks of the doublet, resulting from the change in X-ray penetration depth" (p. 16, second paragraph under "Conclusions"). Furthermore, Neerinck's Figure 2 shows that 1) at an incidence angle (ω) of 0.45° the intensity of the low-angle peak from the stressed top layer is larger than the intensity of the high-angle peak from the stress-free bottom layer (Fig. 2(b)), 2) at an incidence angle (ω) of 0.7° the intensities of those two peaks are about equal (Fig. 2(c)), and at an incidence angle (ω) of 5° the intensity of the low-angle peak from the stressed top layer is smaller than the intensity of the high-

[1] A discussion of the Appellant's admitted prior art and Adurodija is not necessary to our decision.

angle peak from the stress-free bottom layer (Fig. 2(d)). Thus, Neerinck shows that increasing the incidence angle (ω) decreases the intensity of the low-angle peak relative to the high-angle peak.

The Examiner (Ans. 5) and the Appellant (Br. 7) agree that the intensity ratio of the low-angle peak to the high angle peak in Neerinck's Figure 1 is about 0.45. That ratio in Neerinck's Figure 2(d) is about 0.65 (4.2/6.5). Neerinck states that "[i]ncreasing ω leads to a relative increase of the high-angle peak intensity since in the limiting Bragg-Brentano geometry the high-angle peak has a higher peak intensity than the low-angle peak (Fig. 1)" (p. 13, third paragraph under "Experimental"). Thus, Neerinck indicates that intensity ratios between the about 0.65 in Figure 2(d) and the about 0.45 in Figure 1, such as the Appellant's ratio of around 0.5, are obtainable by proper selection of an incidence angle (ω) between those used to obtain Figures 1 and 2(d). The Appellant's claims are not limited to any particular incidence angle.

The Appellant argues that the Appellant's intensity ratio of at least 0.48 and around 0.5 provides an unexpected result (Reply Br. 4).

That argument is not well taken because the Appellants have not provided a side-by-side comparison of the claimed invention with the closest prior art which is commensurate in scope with the claims, and explained why the results would have been unexpected by one of ordinary skill in the art. *See In re Baxter Travenol Labs.*, 952 F.2d 388, 392 (Fed. Cir. 1991); *In re De Blauwe*, 736 F.2d 699, 705 (Fed. Cir. 1984); *In re Grasselli*, 713 F.2d 731, 743 (Fed. Cir. 1983); *In re Clemens*, 622 F.2d 1029, 1035 (CCPA 1980); *In re Freeman*, 474 F.2d 1318, 1324 (CCPA 1973); *In re Klosak*, 455 F.2d 1077, 1080 (CCPA 1972).

Accordingly, we are not convinced of reversible error in the rejection under 35 U.S.C. § 103.

DECISION/ORDER

The rejection of claims 8-11, 14, 19 and 20 under 35 U.S.C. § 112, first paragraph, written description requirement, is reversed. The rejection of claims 8-11, 14, 19 and 20 under 35 U.S.C. § 103 over the Appellant's admitted prior art in view of Neerinck and Adurodija is affirmed.

It is ordered that the Examiner's decision is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a).

AFFIRMED

tc